

FURTHER TRANSFERS OF GLANDULAR-PUBESCENT SPECIES FROM
CHENOPODIUM SUBG. *AMBROSIA* TO *DYSPHANIA* (CHENOPODIACEAE)

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ABSTRACT

The following new combinations in *Dysphania* are proposed for 21 species previously placed in *Chenopodium* subg. *Ambrosia*: ***Dysphania melanocarpa*** (J.M. Black) Mosyakin & Clemants, ***D. pusilla*** (Hook. f.) Mosyakin & Clemants, ***D. truncata*** (P.G. Wilson) Mosyakin & Clemants, ***D. saxatilis*** (P.G. Wilson) Mosyakin & Clemants, ***D. andicola*** (Phil.) Mosyakin & Clemants, ***D. burkartii*** (Aellen) Mosyakin & Clemants, ***D. dunosa*** (L.E. Simón) Mosyakin & Clemants, ***D. oblanceolata*** (Speg.) Mosyakin & Clemants, ***D. retusa*** (Juss. ex Moq.) Mosyakin & Clemants, ***D. sooana*** (Aellen) Mosyakin & Clemants, ***D. tomentosa*** (Thouars) Mosyakin & Clemants, ***D. venturii*** (Aellen) Mosyakin & Clemants, ***D. bonariensis*** (Hook. f.) Mosyakin & Clemants, ***D. microcarpa*** (Phil.) Mosyakin & Clemants, ***D. nepalensis*** (Colla) Mosyakin & Clemants, ***D. procera*** (Hochst. ex Moq.) Mosyakin & Clemants, ***D. dissecta*** (Moq.) Mosyakin & Clemants, ***D. mandonii*** (S. Watson) Mosyakin & Clemants, ***D. stellata*** (Standley) Mosyakin & Clemants, ***D. congolana*** (Hauman) Mosyakin & Clemants, and ***D. minuata*** (Aellen) Mosyakin & Clemants.

KEY WORDS: *Chenopodiaceae*, *Chenopodium*, *Dysphania*, nomenclature, new combinations, taxonomy

RESUMEN

Se proponen las siguientes combinaciones nuevas en *Dysphania* para 21 especies previamente asignadas a *Chenopodium* subg. *Ambrosia*: ***Dysphania melanocarpa*** (J.M. Black) Mosyakin & Clemants, ***D. pusilla*** (Hook. f.) Mosyakin & Clemants, ***D. truncata*** (P.G. Wilson) Mosyakin & Clemants, ***D. saxatilis*** (P.G. Wilson) Mosyakin & Clemants, ***D. andicola*** (Phil.) Mosyakin & Clemants, ***D. burkartii*** (Aellen) Mosyakin & Clemants, ***D. dunosa*** (L.E. Simón) Mosyakin & Clemants, ***D. oblanceolata*** (Speg.) Mosyakin & Clemants, ***D. retusa*** (Juss. ex Moq.) Mosyakin & Clemants, ***D. sooana*** (Aellen) Mosyakin & Clemants, ***D. tomentosa*** (Thouars) Mosyakin & Clemants, ***D. venturii*** (Aellen) Mosyakin & Clemants, ***D. bonariensis*** (Hook. f.) Mosyakin & Clemants, ***D. microcarpa*** (Phil.) Mosyakin & Clemants, ***D. nepalensis*** (Colla) Mosyakin & Clemants, ***D. procera*** (Hochst. ex Moq.) Mosyakin & Clemants, ***D. dissecta*** (Moq.) Mosyakin & Clemants, ***D. mandonii*** (S. Watson) Mosyakin & Clemants, ***D. stellata*** (Standley) Mosyakin & Clemants, ***D. congolana*** (Hauman) Mosyakin & Clemants, y ***D. minuata*** (Aellen) Mosyakin & Clemants.

INTRODUCTION

The genus *Chenopodium* L. (Chenopodiaceae) in its traditional wide circumscription has long been suspected to be an unnatural (polyphyletic or paraphyletic) union of taxa belonging to different phylogenetic lineages. Consequently, many segregate genera and infrageneric taxa of various ranks were described and accepted within this group by various authors (see an overview in Scott, 1978). The genus *Dysphania* R. Br. during its turbulent taxonomic and nomenclatural history also experienced numerous shifts: from a single genus of a separate family Dysphaniaceae (Pax & Hoffmann 1934) or a representative of Illecebraceae or Caryophyllaceae—to a mere section of *Chenopodium* s.l. (Aellen 1930a, 1930b; see also discussion in: Eckardt 1967; Mabry & Behnke 1976; Scott 1978; Wilson 1983, 1984; Mosyakin & Clemants 2002, and references therein). The present article continues a series of our publications (Mosyakin 1993; Mosyakin & Clemants 1996, 2002; Clemants & Mosyakin 2003) on *Chenopodium* L. s.l. and its segregates.

Earlier (Mosyakin & Clemants 2002) we justified the transfer of species previously placed in *Chenopodium* L. subg. *Ambrosia* A.J. Scott, commonly called and henceforth referred to as glandular chenopods, to the genus *Dysphania*, and validated new taxonomic combinations in preparation for the treatment of the genus in *Flora of North America north of Mexico* (Clemants & Mosyakin 2003). At that time we made 18 new combinations, including 11 at the species level, 4 at the section level, and 3 at the level of subsection. Nomenclatural changes were essentially limited to taxa occurring in North America (both native and introduced), leaving a number of glandular chenopods yet to be formally transferred to *Dysphania*.

The taxonomic and nomenclatural decisions treating glandular chenopods within an expanded *Dysphania* were further discussed in the Dr. Sci. dissertation of Mosyakin (2003). The genus *Dysphania* circumscribed so as to include all glandular taxa of *Chenopodium* has been accepted for the treatments of *Chenopodiaceae* in *Flora of North America north of Mexico* (Clemants & Mosyakin 2003) and *Flora of China* (Zhu Gelin, Mosyakin & Clemants 2003). At least one additional transfer of a species from *Chenopodium* to *Dysphania* (*D. pseudomultiflora* (Murr) Verloove & Lambinon) has been made (Verloove & Lambinon 2006) since then.

Here we validate new combinations in *Dysphania* for other species not transferred to that genus earlier. We refrain here from making specific conclusion on phylogenetic relationships within *Dysphania*. However, judging from a thorough analysis of relevant literature, our herbarium and field experience, studies of morphology and biogeography of glandular chenopods, we firmly believe that *Dysphania* in the new circumscription is a natural phylogenetic unit distinct from *Chenopodium* s.s. Since 2002 it was partly confirmed by molecular phylogenetic studies.

DISCUSSION

Results of recent molecular studies confirmed to some extent a deep phylogenetic split between at least three branches (clades) containing taxa previously traditionally placed in *Chenopodium* s.l. (Kadereit et al. 2003, 2005). Species of *Chenopodium* s.l. appeared scattered in three lineages informally named Chenopodieae I, II, and III. The segregation of species between these three clades mainly corresponded to recognized subgenera of *Chenopodium* s.l. (subgenera *Chenopodium*, *Blitum* (L.) I. Hiitonen, and *Ambrosia* A.J. Scott, respectively; see Scott, 1978). In particular, Kadereit et al. (2003, p. 976) indicated: "In Chenopodieae III, a close relationship of the Eurasian species *Chenopodium botrys* and *Teloxys aristata*, and of the Australian species *Chenopodium cristatum* and *Dysphania glomulifera*, is supported by the presence of multicellular glandular hairs (type 8 in Carolin 1983). By that character, they fit into subgenus *Ambrosia* (Scott 1978; Simón 1996). <...> These results confirm the proposal of Mosyakin and Clemants (2002) to transfer *Chenopodium* subg. *Ambrina* [sic! – S. M. & S. C.] to *Dysphania* <...>." In a study of the origin and age of Australian Chenopodiaceae Kadereit et al. (2005, p. 74) indicated that "[r]ecently, Mosyakin and Clemants (2002) used morphological characters to separate subg. *Ambrosia* from *Chenopodium*, and included it in *Dysphania*. This last view is strongly supported by our results."

Other options alternative to our wide circumscription of *Dysphania* would be to recognize several genera, for example, *Teloxys* Moq. (including only *Chenopodium aristatum* L. = *T. aristata* (L.) Moq., or also other related taxa), *Roubieva* Moq. (mainly an American group, which may be recognized either in the original sense of Moquin-Tandon (1834), or with addition of other American taxa), the Australian group previously placed in *Chenopodium* sect. *Orthosporum* R.Br., and Australian *Dysphania* in its traditional circumscription. These groups, corresponding mainly to sections in various classification schemes of *Chenopodium* s.l., seem to be natural. However, recognition of such groups as genera, at least at our present level of knowledge, has its negative aspects related to paraphyly or yet uncertain phylogenetic positions of many taxa. In our opinion, a slightly expanded circumscription of *Dysphania* (including related sect. *Orthosporum*, but excluding other non-Australian taxa) would be also inconvenient, because it will erase practically applicable morphological diagnostic characters distinguishing the resulting broader genus from other glandular taxa.

For avoiding such problems and for maintaining the nomenclatural stability we strongly prefer to place all glandular chenopods in *Dysphania*, which is characterized by its glandular trichomes and also by other morphological and biochemical characters extensively discussed in literature (Scott 1978; Carolin 1983; Wilson 1983; 1984; Palomino et al. 1990; Schwarzová 1993; Simón 1995, 1996; Bonzani et al. 2003 etc.).

In the present article we validate 21 new nomenclatural combinations at the species level resulting from the transfers of glandular-pubescent species to *Dysphania*. A moderately narrow species concept is applied, which is mainly consistent with prevalent taxonomic treatments of "glandular chenopods" and species of *Chenopodium* s.l. We admit that many species of the considered groups are in need of further revisions and more detailed studies, but that should not preclude making available new combinations in *Dysphania* for

them. In addition to our experience and herbarium studies of these taxa, we especially consulted with and relied upon the basic taxonomic publications by Aellen (1930a, 1930b, 1933, 1973), Aellen and Just (1943), Wilson (1983, 1984, 1987), Simón (1995, 1996, 1997), as well as other relevant works (Voroshilov 1942; Scott 1978; Carolin 1983; Weber 1985; Palomino et al. 1990; Kühn 1993; Schwarzová 1993; Uotila 1997, 2001).

VALIDATION OF THE NEW COMBINATIONS

1. *Dysphania* sect. *Orthospora* (R. Br.) Mosyakin & Clemants, *Ukrayins'k. Bot. Zhurn.* 59:382. 2002.

Several names of putative hybrids between Australian taxa belonging to *Dysphania* sect. *Orthospora* were published (Aellen 1933, 1961; Wilson 1983, 1984). However, since their taxonomic status remains uncertain and their hybrid origin is mostly in need of confirmation, we refrain from making here any new combinations for hybrids.

Dysphania melanocarpa (J.M. Black) Mosyakin & Clemants, comb. nov. BASIONYM: *Chenopodium carinatum* R. Br. var. *melanocarpum* J.M. Black, *Trans. & Proc. Royal Soc. South Australia* 46:566. 1922. *Chenopodium melanocarpum* (J.M. Black) J.M. Black, *Trans. & Proc. Royal Soc. South Australia* 58:173. 1934.

Dysphania pusilla (Hook. f.) Mosyakin & Clemants, comb. nov. BASIONYM: *Chenopodium pusillum* Hook. f., *Handb. New Zealand Fl.* 1:231. 1864.

Dysphania truncata (P.G. Wilson) Mosyakin & Clemants, comb. nov. BASIONYM: *Chenopodium truncatum* P.G. Wilson, *Nuytsia* 4:177. 1983.

Dysphania saxatilis (P.G. Wilson) Mosyakin & Clemants, comb. nov. BASIONYM: *Chenopodium saxatile* P.G. Wilson, *Nuytsia* 4:179. 1983.

The last species was described by Wilson (1983) from Western Australia as *C. saxatile*. The author of the species noted that “[s]uperficially this species would appear to be related to the 4-merous species in the genus *Dysphania* (e.g. *D. rhadinostachya*) but in seed character it is obviously different, being very similar to *Chenopodium pumilio* and its allies of the section *Orthospora*. Yet even here its placement is uncertain since the other species of this section have flowers arranged in compact glomerules, have one stamen, and normally a 5-merous perianth.” (Wilson 1983, p. 180). Wilson also compared his species with members of the *Chenopodium botrys* group (which evidently differ from *C. saxatilis* in having 5-merous perianth and horizontal seeds) and section *Margaritaria* (which has whitish subglobose, as well as glandular, hairs, and some other distinctive characters, see Brenan 1956), and concluded that “it appears that *C. saxatile* does not fit satisfactorily into any of the presently recognized groups.” P.G. Wilson refrained from describing a new monotypic section and instead expanded the circumscription of *Chenopodium* sect. *Orthosporum* to include his species. Pending further research, we keep the species in *Dysphania* sect. *Orthospora*.

2. *Dysphania* sect. *Adenois* (Moq.) Mosyakin & Clemants, *Ukrayins'k. Bot. Zhurn.* 59:382. 2002.

In our previous publications (Mosyakin & Clemants 2002; Clemants & Mosyakin 2003; Zhu Gelin et al. 2003) we mentioned that opinions vary widely regarding the proper species delimitation in this section, with some authors recognizing just a few species, including extremely polymorphic *Chenopodium ambrosioides* L. with infraspecific taxa, while other authors preferring several (up to 12) more narrowly circumscribed species (Aellen 1929, 1961, 1973; Aellen & Just 1943; Voroshilov 1942; Simón 1996, 1997; Giusti 1997). Sometimes the same author (notably Aellen) in different periods of his work was of differing opinions regarding the number of species related to *C. ambrosioides*. We believe that taxa in this group differ from each other not less than many generally recognized species of *Chenopodium* s.l. (subg. *Chenopodium*), especially in the *C. album* group. Numerous infraspecific entities were recognized in *C. ambrosioides* and some other variable taxa. In the present article we are concerned with the species-level taxonomy, and thus for the time being refrain from making any new infraspecific and infrageneric combinations.

Dysphania andicola (Phil.) Mosyakin & Clemants, comb. nov. BASIONYM: *Ambrina andicola* Phil., Anales Univ. Chile, I. Mem. Ci, Mem. Ci. Lit. 91:422. 1895. *Chenopodium ambrosioides* var. *andicola* (Phil.) Aellen, Feddes Repert. Spec. Nov. Regni Veg. 26:37. 1929.

Dysphania burkartii (Aellen) Mosyakin & Clemants, comb. nov. BASIONYM: *Chenopodium ambrosioides* L. subsp. *burkartii* Aellen, Feddes Repert. Spec. Nov. Regni Veg. 26:37. 1929. *Chenopodium burkartii* (Aellen) Vorosch., Bot. Zhurn. S.S.S.R. 27(3/4):46. 1942.

Dysphania dunosa (L.E. Simón) Mosyakin & Clemants, comb. nov. BASIONYM: *Chenopodium dunosum* L.E. Simón, Bull. Mus. Natl. Hist. Nat., B, Adansonia 10:407. 1988 [1989].

Dysphania oblanceolata (Speg.) Mosyakin & Clemants, comb. nov. BASIONYM: *Chenopodium ambrosioides* L. var. *oblanceolatum* Speg., Anales Mus. Nac. Hist. Nat. Buenos Aires 7:137. 1902. *Chenopodium oblanceolatum* (Speg.) Giusti in Correa, Fl. Patagonica (Colecc. Cient. 8) 4a:122. 1984.

Dysphania retusa (Juss. ex Moq.) Mosyakin & Clemants, comb. nov. BASIONYM: *Chenopodium retusum* Juss. ex Moq. in DC., Prod. 13(2):73. 1849.

Dysphania sooana (Aellen) Mosyakin & Clemants, comb. nov. BASIONYM: *Chenopodium sooanum* Aellen, Acta Bot. Acad. Sci. Hung. 19(1/4):5. 1973 (as "sooianum").

Dysphania tomentosa (Thouars) Mosyakin & Clemants, comb. nov. BASIONYM: *Chenopodium tomentosum* Thouars, Fl. Tristan d'Acugna 38. 1811.

Dysphania venturii (Aellen) Mosyakin & Clemants, comb. nov. BASIONYM: *Chenopodium ambrosioides* L. subsp. *venturii* Aellen in Aellen & Just, Amer. Midl. Naturalist 30:51. 1943. *Chenopodium venturii* Aellen ex Vorosch., Bot. Zhurn. S.S.S.R. 27(3/4):46. 1942 (invalid name: Russian description). *Chenopodium venturii* (Aellen) Cabrera, Revista Invest. Agric. 11:384. 1958.

3. **Dysphania** sect. **Roubieva** (Moq.) Mosyakin & Clemants, Ukrayins'k. Bot. Zhurn. 59:382. 2002.

Dysphania bonariensis (Hook. f.) Mosyakin & Clemants, comb. nov. BASIONYM: *Roubieva bonariensis* Hook. f. in Benth. & Hook. f., Gen. Pl. 3:52. *Chenopodium bonariense* (Hook. f.) Hauman & Irigoyen, Anales Mus. Nac. Hist. Nat. Buenos Aires 32:90. 1923, comb. illeg., non Ten. 1833. *Chenopodium haumanii* Ulbr. in Engl. & Prantl, Nat. Pflanzenfam. 16c:491. 1934.

Dysphania microcarpa (Phil.) Mosyakin & Clemants, comb. nov. BASIONYM: *Roubieva microcarpa* Phil., Anales Univ. Chile (Santiago), Mem. Cient. Liter. 91:423. 1895.

4. **Dysphania** sect. **Botryoides** (C.A. Mey.) Mosyakin & Clemants, Ukrayins'k. Bot. Zhurn. 59:383. 2002.

4a. **Dysphania** sect. **Botryoides** (C.A. Mey.) Mosyakin & Clemants subsect. **Botrys** (Aellen & Iljin) Mosyakin & Clemants, Ukrayins'k. Bot. Zhurn. 59:383. 2002.

The name of this subsection within the genus *Chenopodium* is often incorrectly cited as a combination *Chenopodium* subsect. *Botrys* (W.D.J. Koch) Aellen & Iljin. Since the name published by Koch is illegitimate, the above subsectional name should be attributed to Aellen and Iljin, who provided its description only in Russian, but also included a reference to the earlier pre-1935 publication and description by Koch, which makes their subsection validly published.

Dysphania nepalensis (Colla) Mosyakin & Clemants, comb. nov. BASIONYM: *Chenopodium nepalense* Colla, Herb. Pedemont. 5:571. 1836.

Chenopodium multiflorum Moq. in DC., Prodr. 13(2):75. 1849.

This little-known Central Asian species morphologically resembles *D. schraderiana* in its habit, but differs in having weakly keeled perianth segments with simple non-glandular hairs at the keel (Uotila 1993, 1997).

Another species closely related to *D. schraderiana* was recently transferred from *Chenopodium* to *Dysphania* as *D. pseudomultiflora* (Murr) Verloove & Lambinon (= *Chenopodium foetidum* Schrad. subsp. *pseudomultiflorum* Murr, *C. schraderianum* Schult. var. *pseudomultiflorum* (Murr) Aellen, *C. pseudomultiflorum* (Murr) Uotila) (Verloove & Lambinon 2006). Uotila (2001) indicated that this species of South African origin differs from

C. schraderianum in its more branched habit, leaves with more lobes and teeth, keeled but not cristate tepals with sessile glands and long hairs, and smaller seeds.

Dysphania procera (Hochst. ex Moq.) Mosyakin & Clemants, comb. nov. BASIONYM: *Chenopodium procerum* Hochst. ex Moq. in DC. Prod. 13(2):75. 1849.

4b. *Dysphania* sect. *Botryoides* (C.A. Mey.) Mosyakin & Clemants subsect. ***Incisa*** (Standley) Mosyakin & Clemants, Ukrayins'k. Bot. Zhurn. 59:383. 2002.

Dysphania dissecta (Moq.) Mosyakin & Clemants, comb. nov. BASIONYM: *Ambrina dissecta* Moq., Chenop. Monogr. Enum. 38. 1840. *Chenopodium dissectum* (Moq.) Standley, N. Amer. Fl. 21:26. 1916.

Dysphania mandonii (S. Watson) Mosyakin & Clemants, comb. nov. BASIONYM: *Teloxys mandonii* S. Watson, Proc. Amer. Acad. Arts. Sci. 9:91. 1874 (as "*mandoni*"). *Chenopodium mandonii* (S. Watson) Aellen, Feddes Repert. Spec. Nov. Regni Veg. 26:169. 1929.

Chenopodium incisum Poir. var. *bangii* Murr, Bull. Herb. Boissier 4:991. 1904. *Chenopodium graveolens* Willd. var. *bangii* (Murr) Aellen, Verh. Naturf. Ges. Basel 41:107. 1931.

5. Taxa yet unplaced in sections of *Dysphania*

Dysphania stellata (Standley) Mosyakin & Clemants, comb. nov. BASIONYM: *Chenopodium stellatum* S. Watson, Proc. Amer. Acad. Arts. Sci. 18:146. 1883. *Meiomeria stellata* (S. Watson) Standley, N. Amer. Fl. 21:7. 1916.

This morphologically deviant species having 6-8 perianth segments (described from Coahuila, Mexico) was placed by Standley (1916) in a separate genus *Meiomeria* Standley, and then transferred to *Chenopodium* sect. *Meiomeria* (Standley) A.J. Scott (Scott 1978). Relationships of this little-known taxon with other representatives of *Dysphania* remain insufficiently known.

Dysphania congolana (Hauman) Mosyakin & Clemants, comb. nov. BASIONYM: *Chenopodium glaucum* L. var. *congolana* Hauman, Bull. Jard. Bot. État. Bruxelles 19:447. 1949. *Chenopodium congolanum* (Hauman) Brenan, Kew Bull. 11(1956):166. 1956.

Dysphania minuata (Aellen) Mosyakin & Clemants, comb. nov. BASIONYM: *Chenopodium minuatum* Aellen, Acta Bot. Acad. Sci. Hung. 19(1/4):8. 1973.

Dysphania congolana, an African species, was placed by Brenan (1956) in *Chenopodium* sect. *Margaritaria* Brenan, as *C. congolanum*; later Simón (1996) added *D. minuata* to this section (as *C. minuatum*).

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